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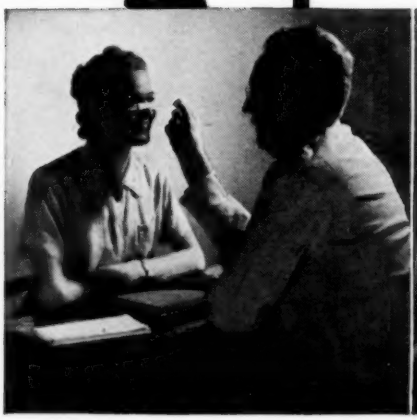

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He: Yes. You can see for yourself. Look here and I'll show you how Loxit is made.

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She: Oh, I see. That's why the lenses don't break so often.

He: That's right. And look—isn't this good looking?

She: Oh, my yes! Why that engraving looks just like fine jewelry. That's the style I would like to wear!

He: There now, that's a perfect fit! This style certainly complements your appearance too! How do they feel?

She: They do feel comfortable . . . and so light! I wonder how they look.

She: Why . . . they are perfectly lovely . . . so inconspicuous. I believe they actually make me look better.

He: Yes, they *are* becoming because that Loxit bridge is ideal for your features.

She: Well, I can't tell you how pleased I am! You just wager I'll tell all my friends about you . . . and about this good looking Loxit mounting!

He: (Just grins because he knew she would say that.)

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AMERICAN JOURNAL OF OPTOMETRY

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AMERICAN JOURNAL OF OPTOMETRY

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VISUAL TESTS EMPLOYED IN HIGHWAY SAFETY WORK IN THE STATE OF NEBRASKA*

Leo G. Miller, Opt.D.
Chairman, Legal and Legislative Committee of the
Nebraska Association of Optometrists
Lincoln, Nebraska

On September 1, 1937 a law which has been enacted by the Nebraska Legislature earlier in the year went into effect, making it mandatory for every automobile driver to get a new driver's license. This new piece of legislation required every applicant for a driver's license to pass a visual test, and further required that every second year the license must be renewed and the visual test repeated.

During the legislative campaign, early in the year 1937, the optometric group working with the State Safety Council had incorporated into the law a clause regarding visual tests along with other drivers' requirements which had to be met before the license could be issued to an applicant. The new law specified the optometrist as the eye specialist to whom the applicant would have to turn should he or she be rejected by the highway officials in that portion of the examination having to do with vision.

Those applicants, whose vision was of such character as to fall below the visual standards set up by the law, were required to have their eyes examined by an optometrist or a physician and to present to the highway examining officials a certificate from the optometrist or the physician stating that the vision of the applicant had been corrected by either treatments or by means of lens correction.

In the new law just mentioned, the type of visual tests to be passed by the applicant and the visual standards to be met by the applicant were to be determined by the combined offices of the State Sheriff and the State Highway Department. These official bodies, working with the State Safety Council and the optometric society set up the minimum visual requirements for driving a motor car.

After giving careful consideration to the many phases of this subject it was decided to establish a minimum standard of visual acuity of

*Submitted for publication August 26, 1938.

O.U. 20/40. In other words, at least one eye had to have at least 20/40 visual acuity to pass the test or the applicant would be rejected. At this point Dr. Edwin H. Silver, optometrist of Washington, D. C., Chairman of the Motor Vision Commission of the American Optometric Association, was very helpful. Dr. Silver submitted to the Nebraska officials the statistical material his department had compiled on this subject. Through Dr. Silver and his department, our Association was also furnished the assistance of Dr. A. H. Lauer of Ames, Iowa. Dr. Lauer being one of the foremost authorities on subject of the vision of motor car drivers in America, his help was of great value in making many decisions essential to the future program of this activity in Nebraska.

When the first series of tests were made, during September and October, and through November, 1937, only a test card was used in the various counties. This was done because of the necessity of speed in the rush to get drivers' licenses. However, beginning on December first, after extensive training of highway patrolmen for six weeks time prior to this date, a new method was incorporated for those desiring driver's license.

Keystone Telebinoculars and a series of cards were purchased by the Nebraska Division of Highway Safety and Patrol. The patrolmen who were trained with this instrument, set dates for making tests in central points throughout the state. Having a certain time for new drivers reaching the age of 16 or new residents of the state to have their tests made.

At the present time these Keystone visual tests are still being made by the highway patrol service. The tests are as follows:

Test 1. Slide DB-10.

Test 2. Slide DB-1. Acuity of Left eye.
Slide DB-2. Acuity of Right Eye.
Slide DB-3. Acuity of both eyes.

Test 3. Stereopsis Level.
Slide DB-6.

Test 4. Vertical Imbalance at Far Point.
Slide DB-6.

Test 5. Far-Point Fusion.
Slide DB-4.

Test 6. Lateral Imbalance at Far Point.

Test 7. Color Test
Slide DB-11, Red-Green.
Slide DB-12, Blue-Yellow.

For the time being only, a visual rating of less than O.U. 20/40 as indicated in Test No. 2 will reject the applicant from passing the visual portion of the license test. If the other visual tests given the applicant, *i.e.*, Test Nos. 1, 3, 4, 5, 6 and 7 indicate abnormalities or subnormal visual functions the applicant is given a card indicating this and

advising the subject, in the interest of public safety to have his or her eyes examined at once.

Applicants whose binocular visual acuity falls below the minimum requirement of 20/40 are given a notice of this fact and are required to take this notice to the eye specialist of their choice whose duty it is to bring the acuity of vision of the applicant up to, or above the minimum requirement. If this can be done, the examiner than fills out the form shown in Figure 1, which is returned to the highway patrol office by the applicant who is then accepted.

CERTIFICATE OF VISION

....
Applicant's Signature

I have examined the eyes of applicant whose signature appears above and I hereby certify that applicant's vision is now:

With lenses R. / Without lenses R /
L. / L. /

Date..... .....

M. D.
Signed ..... O. D.

Address .....

Under no circumstances must this certificate be issued unless vision is 20/40 or better

Fig. 1

As a matter of record the following statistics may be of interest. Prior to December 4, 1937, 508,080 persons made application in Nebraska for a new driver's license. Of this number 4,282 were rejected because of defective vision. During the period from December 4, to July 1, 1938, inclusive, 37,778 applicants were examined by patrolmen using the Keystone Telebinocular. Of this number 359 have been rejected because of visual deficiency. In this group of 37,778 persons a considerable number of applicants appeared who had been examined for an operator's license prior to the time they appeared and had their eyes given proper attention allowing them to pass this test.

Gradually, the requirements for auto drivers visual standards will be increased beyond just the visual acuity. The seven tests enumerated above will serve as a basis of rejection in Nebraska. It has been suggested that failure in any two tests other than visual acuity will eliminate the driver until he has proper eye coordination. Until such time as is opportune, this will be held up. Eye fatigue as well as acuity creates a hazard and this will be overcome when these other tests are put into operation.

State Sheriff Flake, Captain Weller and Lieutenant Scherin of the Nebraska Highway Safety and Patrol are to be highly commended in their fine work of eliminating many unfit motor car drivers through these eye tests. These men and their assistants have worked hard and faithfully to give the citizens of Nebraska the best patrol system possible and their efforts are being rewarded by the general improvement evidenced in all branches of patrol and safety work. If every state had men of this caliber at the head of their highway safety work, the accident toll every day would be brought down to a minimum.

During the last eight months the highest percentage of visual rejections has been 1.2 per cent and during June this year it dropped to .6 of one per cent. This indicates that Nebraska drivers are more eye conscious and have their eyes corrected properly, before applying for a license and naturally this makes for better visual comfort as well.

Captain Schrien informs the writer that the reaction to the Keystone instrument has been very favorable. It made the testing uniform and stopped all guess work. All tests throughout the state are made alike and under the same conditions, which is impossible with a mere test chart.

DR. LEO G. MILLER
603 STUART BLDG.
LINCOLN, NEBRASKA

A REVIEW OF SOME OF THE RESEARCH WORK DONE BY RAY M. PECKHAM OF THE OPTOMETRIC RESEARCH INSTITUTE OF DETROIT, MICHIGAN*

F. McFadden, Opt.D., F.A.A.O.
Rutland, Vermont

It would be impossible to more than briefly review this report as written by Ray M. Peckham in the space which can be allotted, for the subjects covered have been so thoroughly developed and the material so completely condensed that they scarcely admit of further abstraction.

Peckham has divided this first report[1] into several sections each dealing with one of the important branches of optometry. This is the first report. We are informed there will be additions to this at a later date. The report as now presented consists of six sections each covering one portion of our work. These sections are as follows:

Measuring Visual Acuity
Amblyopia, Correctible and Non-correctible
Aniseikonia, Anaphoria and Antimetropia
Infantile Strabismic cases
Stereopsis, Stereoscopes and treatment
Juvenile Myopia—use or non-use of bifocals and/or prisms.

MYOPIA

The problem of caring competently for the eyes of young myopes is far more complex than has hitherto been considered. The usual treatment of these cases has generally consisted in giving the child such minus powers as would produce reasonably good blackboard vision, then dismiss the case until vision had again become so impaired as to require further correction. Juvenile myopia under such incompetent procedure is necessarily almost always progressive.

Peckham analyzes these cases, dividing them into esophores of high and low degree, as well as exophores. He discusses when base-in prisms may be used in connection with single-vision powers, and also holds out hope that before myopia has become seated, or definitely established by an increase of the eyeball length, that simple base-in prisms often reach

[1] The entire report may be secured by writing to Ray M. Peckham, Optometric Research Institute of Detroit. The cost of the report is $2.

*Submitted for publication August 10, 1938.

the seat of difficulty, and that even these may be abandoned after ocular reflexes have become well established—provided competent jurisdiction is maintained.

He also indicates where bifocals with base-in prisms may be beneficial, and when the segments may, in certain types of cases be removed. Whether or not myopia can be materially reduced, or in case of only a slight actual ammetropia that it may eventually be normalized so that minus lenses can be abandoned while retaining competent far vision, is discussed, but Peckham is very broad and liberal in most places, for he often remarks that none of us are positive, it may be so, it may not.

Of one thing the writer is even more certain: That every case of myopia, and more particularly every juvenile myope, needs far more study, care, treatment, and general supervision than we accord them. Some things either become worse, progressing rapidly, or they tend to become stationary for a while, but *can never be better*. Myopia is worth a hundred times more care than it has hitherto received.

VISUAL ACUITY

Peckham differentiates strongly between *Visual Acuity* and *Form Perception*. Acuity or resolving power depends upon the four factors: Optical perfection or imperfection of the eye, exactness of focus, rod or cone density of the part of the retina on which the image falls, and the sensitiveness of these rod or cone receptors at the particular moment the test is made. In addition, acuity varies with the illumination, the color-quality of this light, the fatigue or the calmness of the subject, as well as other mental or physical states.

Visual acuity therefore varies under these tests, hence our test charts, their manner of illumination, as well as characters are not an absolute criterion. He discusses the straight-away distance as associated with that by way of a mirror, reflected. He also discusses the apparent difference in acuity when every other condition is identical in the test except that a larger or smaller area of illumination is exposed, saying that 20/30 vision (33%) with a wide field of illumination should be raised to 20/25 vision (40%) by narrowing the illuminated area. (This is the reverse of what the writer has frequently found.) But he also believes that the patient's discrimination between two lenses is reduced, astigmatic or others, with lens area of illumination of the same lumens.

Peckham compares the illuminated letter chart with one having a translucent background, although he has not discussed the projected charts here. He again mentions letter *recognition* and letter *vision* in the defining of acuity.

He refers to a former article where he discussed the poor type of case reports due to lack of standardized charts, standardized distances, standardized illumination (and he might with equal force have mentioned a common practice of quoting acuity in 20/20 when the chart distance is anything between 20 and 10, 11 or 12 feet).

In referring cases to other optometrists, case reports covering acuity are garbled unless actual distance, type of illumination, as well as light power is specified, in "setting up controls."

Acuity varies in different meridians of the eyes. In fact, it is commonly about 0.2 to 0.4 mm. or a coverage of 0.75° to 1.5°, dropping sharply from the fovea. In practice, it is quite apparent that horizontal macular coverage extends several letters to each side of centrality, but only a slighter distance into the line above or below.

From recent investigations by Peckham and others we have come to doubt very seriously whether the macular and foveal limitations are actually as circumscribed as our text books and teachings have hitherto proclaimed. One thing is now definitely known, this being that there is no such thing as "corresponding retinal points," a fallacy which was established over half a century ago.

STRABISMUS AND SUBNORMAL VISION

Here Peckham differentiates between improvable and non-improvable strabismics, evidently concluding that some cases are beyond reclamation. He describes various tests for these cases before forming any opinion one way or other. It is true that no one test, no single technique, no single conception of the procedure in visually improving these cases can possibly be layed down dogmatically.

The competent refractionist must be ever prepared to change his direction of attack and alter his methods to suit the individual case. Peckham concludes that the retinal image has not impinged upon the macula sufficiently to inspire its proper activity, but that falling upon an outer area there has come to be a zone somewhat superiorly sensitive to have become known as false-macula. He has learned that this zone may be changed by various prism placements in such manner as to greatly improve vision, and under proper technique to well nigh restore acuity. He often uses prisms upon the other eye which has not been hitherto considered the offender, with good results.

Automobile workers in Detroit factories were refused if their vision was below 66% in both eyes, or if one eye was 100% the other must be above 50% and it became imperative that means must be quickly found whereby even a low amblyopia could be improved to meet factory inspection—if an eye were improvable. If it could not be improved execpt by long and costly technique, laborers could not undertake the expense. For these reasons quick methods were required in both testing and treatment.

Strabismic children present quite other problems, for time is not so important. Means must be found to stimulate visual perception entirely aside from strabismus. Again, means must be found to correct the strabismus without direct reference to low acuity. And finally other measures are necessary to co-ordinate these functions.

Peckham is not arbitrary. He offers various methods, suggests others, relates failures with equal candor in comparison with success, but he often remarks that he does not know, perhaps we may some day, at least it is worthy of a trial, and suggestions may sprout from side thoughts.

ANISEIKONIA

Peckham's discussion of this topic is carried through several sections of this report making the review of this subject by the writer, somewhat difficult and at least quite incomplete. Peckham has worked on this subject quite extensively, and has had certain degrees of success and naturally some failures. This is particularly true with some of the specially designed lenses which are often used in the correcting of abnormalities of this character.

Peckham goes to considerable length to show that by more careful manipulation of corrective trial lenses, as to slight differences in power and in axis, a large proportion of so-called aniseikonia cases would not be diagnosed as such. He considers that more care and skill in basic refraction procedures is essential.

He discusses such cases as would accept the following corrections:

O.D. +1.00 D.Sph. = V.A. 100%.
O.S. +6.00 D.Sph. = V.A. 100%.

or

O.D. +11.00 D.Sph. $\frown$ +3.00 D.Cyl. × 90.
O.S. + 1.50 D.Sph. $\frown$ +0.50 D.Cyl. × 90.

or

O.D. — 6.00 D.Sph. = V.A. 50%.
O.S. —12.00 D.Sph. = V.A. 50%.

He points out that in the above cases it is fully evident that macular images are of unequal diameter, due to the differences in corrective powers. Through his work at the Institute he and his fellow workers have devised a simple method which any optometrist can follow without difficulty, for use in these cases which will make the correction of these visual abnormalities much more effective. Peckham's suggestion does not require expensive apparatus. An optometrist can acquire everything needed for several dollars. The details are given in full in the report.

STEREOPSIS

Any adequate synopsis of this portion of the report would be too long for a review of this kind. Peckham has crystallized his experiences of many years until each facet glows with the brilliance of a diamond.

Stereopsis comes into so many portions of modern optometric practice nowadays that one could scarcely discuss it without spreading into limitless fields, any one of which would be worthy of large space and plenty of time.

Stereopsis spreads over into prisms for children as well as presbyopes, into amblyopia, into strabismic types, and involves several orthoptic

techniques. He tritely remarks, in connection with stereoscopic training procedure that "we have the most dogmatic teachings about convergence and accommodation relationships which are the sheerest nonsense.".

Should there be a "relationship" between these functions, on some mathematical basis, for one person, it will not apply to another, nor will it apply to the same person under various physical or mental conditions, nor indeed agree with itself but rarely. As a basic feature for undertaking orthoptics-orthophorics, either stereoscopically or otherwise, it is certain to lead into many blind alleys. Each case should be considered, tested, treated, only upon its own merits.

DR. F. MC FADDEN
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CONGENITAL DISLOCATION OF THE CRYSTALLINE LENS. A CASE REPORT*

H. D. Tansley, R.O.
Kenora, Ontario

Congenital Dislocation of Lens
(A Family Case Report)
The S family, five children ages 8 to 21 years.

History of Family

All in excellent health, no previous pathology or serious illness in children. This confirmed by family physician. Father has alternating converging squint, vision normal in both eyes. Mother's eyes normal. Four of the five children have cases of congenital dislocation of the crystalline lens since birth. Family history traced back on both sides, but no similar ocular condition remembered.

Girl, age 21. Partial luxation of lens in both eyes. Vision very low —can distinguish form and large detail. Reads .1 m. type at 4 inches with difficulty and with right eye only. Iris tremulous on slightest movement of eyes. Lenses opaque, refraction impossible and opthalmometer denotes high irregular astigmatism. It is doubtful whether telescopic lenses would be of value in this case, the tremulousness of the iris causing alternating line of fixation, the head being turned on an angle to see straight ahead or read.

Girl, age 15. Partial luxation of lens, up and out in the right eye, down and in the left eye. Vision unaided O.D. 20/300, O.S., 20/400. Iris slightly tremulous and lenses only slightly opaque. Ophthalmometer O.D. —1.00×180, O.S. —.50×180. Refraction with the retinoscope O.D. +5.50 D.Sph., O.S. +4.00 D.Sph. Correction given, O.D. +6.00 D.Sph. ⌒ 3△ diopter prism base-up. = V.A. 20/70. O.S. +4.00 D.Sph. ⌒ 2△ diopter prism base-down = V.A. 20/60. Binocular V.A. = 20/60. With +2.00 D.Sph., add O.U., patient reads .75 type at 8 inches.

Boy, age 14. Very clever at school work and music. Vision very low in each eye, can read large print with difficulty. Correction given

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from retinoscope findings: O.D. +3.75 D.Sph. = V.A. 20/100. O.S. +7.25 D.Sph. = V.A. 20/150.

Plus 2.00 D.Sph. add O.U., for reading, enables patient to read .75m type at 8 inches. This patient was referred to the Hospital for Children at Toronto, believing an operation might be advisable to improve vision. The hospital report to me was as follows:

"He is one of those interesting cases of congenital dislocation of the lens in both eyes. The lens in the right eye is dislocated pretty well downward and probably does not come into the line of vision at all. The edge of the left lens, however, comes very close to the pupil margin and I fancy at times partly covers the pupil. I certainly do not recommend operation in his case but would prefer to leave well enough alone. He would not get any benefit in vision and would run the risk of marked loss of vitreous."

Girl, age 10. Also a case of partial luxation into the vitreous. A final correction has not been given. A +6.50 D.Sph., O.U., improves vision 20% and I expect after a few more examinations to improve vision even more.

Girl, age 8. This young girl's eyes are normal in every respect.

It is rather interesting that one child of the five has escaped the ocular condition so marked in the others. Several oculists had refused to attempt refraction claiming it would be injurious to the vision. I can see no reason for their attitude as the improvement in vision experienced has been greatly appreciated.

H. D. TANSLEY
GRADUATE OPTOMETRIST
KENORA, ONT., CANADA

BI-CENTRIC LENS WITH TEN DIOPTERS OF PRISM*

George T. Warren, O.D, D.O.Sc.
Washington, D. C.

Anisometropic Corrections is the title of an eminently worthwhile monograph by Virgil H. Hancock.[1] In this paper the author devotes considerable space to slab-off or bi-centric lenses. He says, regarding these lenses, "Numerous cases are on record with equalizing prism power up to 5.00△ giving excellent results."

In placing the limit of prism at 5.00△, Hancock is being very conservative, as the writer has a patient using a slab-off lens carrying precisely twice that amount of prism and is getting splendid results from its use.

Optometrists may suspect that cases of this kind are cases in which either suppression or suspenopsia exists but the writer believes this is not necessarily so, as good single binocular vision is frequently enjoyed by these patients who have practically normal phorias.

To be sure the foregoing comfort was not accomplished with the initial correction but with some effort and patience it was accomplished. A brief report of this case is herewith presented.

Patient: Miss F. R. Came to the writer in 1927. Age. 21. At this time she was using the following correction:

O.D. —2.50 D. Sph.
O.S. —3.00 D. Sph.

An examination disclosed the need for the following:

O.D. —2.50 D. Sph. ⌒ —0.50 D. Cyl. axis 180.
O.S. —12.00 D. Sph. ⌒ —2.00 D. Cyl. axis 170.

This prescription enabled her to have the following distance visual acuity: O.D. 20/30. O.S. 20/200.

The following corrections were then prescribed. For general wear:

O.D. —2.50 D. Sph. ⌒ —0.50 D. Cyl. axis 180.
O.S. —5.00 D. Sph.

And for special treatment use to stimulate the left eye:

O.D. Plano frosted.

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[1] Published by the Univis Corporation.

*Submitted for publication August 30, 1938.

O.S. —12.00 D. Sph. ⌒ —2.00 D. Cyl. axis 170.

Patient returned in 1931. She had used the treatment correction as directed and the results of the second refraction were as follows:

O.D. —2.50 D. Sph. ⌒ —0.75 D. Cyl. axis 170.
O.S. —14.00 D. Sph. ⌒ —3.00 D. Cyl. axis 150.

This correction afforded her an acuity of vision with the right eye of 20/25, and with the left eye of 20/130.

The patient had no suspension of vision with this correction in place but she did have a marked exophoria of about 8△ at a distance and some 21△ at the near-point. Orthoptic treatments would have been of value at this time, but these were impossible in her case. This being true, the writer decided to give the patient the full correction for constant use, deciding also to ignore the exophoria, as I felt that the accommodation would be so re-enlivened in the left eye by the powerful minus lens that the exophoria which seemed to be present at this time would soon subside. This reasoning proved to be correct.

Now it was realized by the writer that no pair of eyes can look downward in such an anisometropic correction as this one proved to be, and not experience diplopia unless some prism aid was incorporated in the correction to overcome this. The writer therefore prescribed a plano-prism segment, base-down on the right lens to equalize the deflection. In this correction there was a difference between the two lenses of approximately 11.50 diopters in the vertical meridian, and the writer estimated that at a point 8.7 mm. below the optical centers of the lenses there would be 10△ of imbalance created in looking through the lenses at this point. The base-down plano-prism prescribed for the right eye was therefore 10△ in strength.

This new correction proved very satisfactory. The patient had little trouble accustoming herself to the new lenses and was pleased with the results except for the cosmetic appearance of the glasses themselves. Each year or so since 1931 I have re-examined her eyes and found the refractive condition to be substantially the same. During this period the visual acuity of the left eye increased to its present level of 20/100.

In 1938 this patient wanted a new correction, and it was her wish that her new glasses be rimless and less noticeable, if this were possible. I explained to her the new method of making a bi-centric lens which would give her the same effect as the plano-prism without the disfiguring line which was unavoidable in the cemented segment lens. A rimless pair were therefore prescribed and made. I specified that the slabing-off process start at a point 3 mm. below the optical center of the heavy left lens and be of an amount sufficient to annul 10△. This made the left lens in its lower portion in deflecting harmony with the other lens. It is hardly necessary to say that the patient was delighted with the new correction. The appearance of the glasses was much improved. The bi-centric lens does have a line of demarkation but the line is very much less noticeable than that of a cement segment.

I have related the foregoing at some length because the technique of bi-centric lens grinding is a rather new and recent innovation in the optical laboratories. The case is of interest, inasmuch as it reviews what can be done in a case of amblyopia ex anopsia due to high myopia by means of lens correction only, and it describes a method of prescribing for diplopia in these troublesome anisometropic cases. The new bi-centric corrections seem to be of value in all cases of this type where the difference between the two eyes is in excess of two diopters.

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THE FEW OF THE ELEMENTARY FUNDAMENTALS OF SQUINT CORRECTION*

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The treatment of squint is today assuming an importance that is to some extent out of proportion to the number of strabismic subjects that exist. This can be traced to a number of causes, but it is due principally to

(a) The added interest in eyesight shown by the general public.
(b) The desire, especially in women, to make the best of their appearance.
(c) Medical propaganda, which is mainly directed to stress the fact that the medical man is the only man capable of correcting squint.
(d) The political importance of every optician[1] being able to take on this work successfully, to counteract the propaganda outlined in section (c).

Competition of any sort, provided it is not malicious in origin, is to be welcomed, and it is an undoubted fact that the prominence given to the new medical orthoptic courses, to be taken by non-medical trainees, who promise to work only under medical supervision has stimulated the entire optical profession into realizing that their prerogative is in some danger of being taken away.

The position is as yet not serious, there must be a limit to the amount of orthoptic work available for full-time workers, but with an increase of these orthoptists, serious competition will arise, and if we as a profession, are not careful, much of this work will pass out of our hands.

Logically, the optical practitioner, with a basic training far in advance of the curriculum laid down for these new orthoptists, is the right man for the job. His knowledge of optics, of the ocular muscles; the effect of prismatic lenses; his superior instruments, give him the right to say "this is my job."

Hitherto, squint training has not been taken up as it ought. In the past the work has been neglected, except by the more advanced, because it was thought to be tedious, success was not always assured and it was unremunerative.

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*An abridgment of the material presented in the Optician, Vol. XCI, No. 2354.
[1] In England, opometrists are referred to as opticians.

Undoubtedly, there was considerable truth in these objections. Under the old methods the amount of time expended by the refractionist was out of all proportion to his remuneration.

The newer methods of squint treatment for which we are so much indebted to Mr. Walter Green, his far seeing colleagues and the late Max Coque, admit of no such objections.

Since the introduction in this country of the methods of squint treatment practiced by the Frenchmen, Cantonnet and Filliozat, it can be said with every truth, that the training of squinters is now a matter of a few months, as against the previous time of some years.

We have learnt that, given the right type of squint, response is quick, and in consequence the work is more remunerative. We have learnt to sift with some certainty the types into those that will respond and those that will not, and we know that our former ideas regarding the age of the squint patient, which assumed the younger the patient the more responsive to orthoptic training, has undergone considerable revision.

We now know that the suitability of a patient for orthoptic training depends more upon the degree of developed intelligence than upon age, and that the younger patients often demand other methods of treatment until their intelligence is sufficient to enable us to continue with our regular orthoptic training.

In consequence of this added interest in the training of the strabismic subject, there is now available for the optical practitioner courses in squint treatment at the various Refraction Hospitals, by certain individual practitioners, at the Northampton Polytechnic Institute and Manchester College of Technology, and many other training centers throughout the country.

It is the aim of this article to stimulate the interest of optical practitioners in this work. An attempt will be made to deal with the modern methods of squint treatment in a simple manner, so that the fundamentals may be more readily grasped. If as a result the practitioner is encouraged to go farther in this work, and experiment for himself, then the purpose of this article will be fulfilled. It is of definite political importance that all optical practitioners have at least a knowledge of the fundamentals underlying this work.

Commencing right at the beginning, it will be necessary to get our definition of strabismus well in mind. Many tendencies to squint, really exophorias or esophorias may, if a cover test is wrongly misinterpreted, be mistaken for manifest squints. Commonly at the end of treatment, a patient whose eyes are now perfectly parallel, may still show a movement if the tendency to use both eyes together, be upset as in a cover test over one eye or if red and green glasses are placed in front of his eyes. Obviously the tendency to squint will be left, but, with fusion sense strongly developed, will not manifest itself under ordinary conditions.

A normal pair of eyes will possess binocular vision, i.e., both eyes

will be used to fix the same object, although one eye may fix (dominant) and the other follow.

In addition, normal binocular vision means that streoscopic vision of high grade is present, and there is as a rule a strong tendency to overcome base-in prisms when viewing a distant spotlight. The amount of this prism (abduction) is usually in the neighborhood of 8△. In addition there exists an ability to overcome prisms base-out (adduction), an average at distance for this being about 24△. A corresponding ability exists for near, generally taken at 33 cm.

Measurements of ductions determine, with some calculations taken in account, the positive (amount of base-out prism accepted at the fixing distance) and negative (amount of base-in prism accepted at the fixing distance) fusional reserve.

Some controversy exists as to what constitutes a true measurement. Some schools of thought maintain in dealing with base-out prisms that the true amount of prism that can be taken into account is the prism (average 12-16 base-out) that causes a blurring of the fixation letter, while others take the total prismatic power that can be tolerated before diplopia is caused, as their criterion.

The blur point is the more reasonable criterion, as increase beyond this point brings into action the accommodation. We try if possible in taking ductions to determine the fusional reserves with fixed accommodation in play. Thus at distance (6 meters) accommodation is for all practical purposes zero, while at 33 cm., using small type, we assume 3 D. of accommodation.

With base-in prisms, we do not stimulate accommodation, hence readings are usually taken to doubling point.

The measurements are usually recorded as Abduction (distant or near). (a) Total prism base-in accepted to doubling point (break). (b) Prism accepted to bring the double images together again (recovery).

This measures the negative fusional reserve, if no imbalance is present. The recovery point can be taken as the normal amount of base-in that can be accepted easily, an important point when prescribing prisms for constant wear. Such prisms should not make our patient see double: hence the significance of knowing the average tolerance. The true negative fusional reserve has of necessity to take into account the imbalance at the distance of fixation.

Adduction, (distant or near). Two measurements. (a) Total prism base-out which when viewing practically normal type, caused it to blur thus 6/9 used as distance approx. J^2 for near (to blur). (b) Total prism accepted to doubling point (break). (c) Prism accepted to bring double images together again (recovery).

Thus (a) measures if no imbalance is present the positive fusional reserve. The point (b) measures the prism accepted when accommodation is greater than necessary at the distance fixed is called for.

(c) Measures the total average prism power possible to the distance.

It should be understood that the significance of the recovery point is to some extent controversial, but it is observed that the recovery point is often more seriously reduced in such cases as low bodily tone, etc., than is the measurement of duction itself, which gives support to the statement that this is the average or normal power that can be accepted without discomfort.

Normally a pair of eyes will converge to a point approximately ¾ inches from the nose. A lack of convergence will exist if inability to do this is found. Thus, it is possible to find an apparent tendency to over-converge at 33 cm. as shown by an esophoria and yet to find at a shorter distance a lack of convergence.

Other factors exist in a normal pair of eyes possessing complete binocular vision, but the most important is the demonstration of physiologic diplopia. Two pencils are held in front of the nose, one at say 6 inches and the other 20 inches. If the eyes see the near one singly the other will of necessity be doubled. Conversely if the reverse condition exists and the far pencil is fixed the near one is doubled.

The explanation of this will be found in any text-book on physiological optics.

Thus normal binocular vision depends to some extent on the ability to recognize diplopia. Two eyes used together normally must at some time see double and we say this is physiological when demonstrated as above. That we do not suffer normally is explained by the fact that in our brains we are capable of neutralizing the double images seen outside the object fixated. We are not conscious of them, except when they are demonstrated to us.

Physiological diplopia must never be confused with constant or occasional diplopia, which may be pathological, or due to a tendency to squint, which is held in check by a fusion sense of such low amplitude (amount) as to fail to keep the eyes parallel all the time.

It will be seen as we proceed that this neutralization of unwanted images, in normal eyes, has a counterpart in the strabismic eye. It is partly for this reason that the term neutralization is becoming more generally used than the terms suppression or suspension. The term, too, explains much that could not be accounted for in previous explanations of the causation of squint.

We can say that an eye that squints has its image neutralized or ignored by the brain. The extent to which this neutralization can take place, even with vision normal in each eye, is truly astounding. It is not uncommon to find that with one eye fixing, a 60 candle power lamp placed in front of the squinting eye *will not be seen*. Cantonnet has referred to squinters as "one eyed," and in effect this is what they are. A squinter may use one eye *all* the time (unilateral) or one eye *at* a time, (alternating) and neutralizing the unwanted image in turn.

To understand the reason for this neutralization we have to go back to the cause. In the beginning, the squint is probably intermittent and with the images being formed on non-corresponding points on the two retinæ, diplopia is caused. Now it is said that Nature abhors diplopia almost as much as she was said to abhor a vacuum, and an attempt is made to get rid of the annoyance. The causes that produce diplopia (squint) are too strong to be overcome, and so the image in the squinting eye is ignored. The eyes are now dissociated, and to all intents and purposes the subject is "one eyed." The longer the brain ignores the squinting eye, the greater the chance of the angle of squint increasing, and of course, the deeper the amblyopia. Hence the importance of prompt treatment.

Though the cause of squint may be a muscular one, this is very rarely the case. A simple experiment will prove this point. Cover the good eye in a convergent squint. This will cause the previously squinting eye to fix a pencil held in the hand. Now move the pencil so that the eye follows its directions up, down, nasally, temporally. In practically every case the movement brought about of course by the ocular muscles, is normal, although in very old standing convergent squints movement temporally may be impaired. Note that this *follows* the onset of squint, and is not a *cause* of the trouble.

The above remarks apply only to concommitant squint. The movement will often be seriously affected in paralytic squint due to pathological causes.

Thus to refer in general to squint work as "muscle work," is wrong. To use a simile adapted from domestic life, we are not educating the muscles, they are the servants. We seek to teach the master (the brain) to again take notice of his hirelings, who do not want to work since he ignored them. When this higher authority again takes notice, there will be no difficulty in getting these servants to work, but they must receive the command or the impulse from above before they will.

In the light of the foregoing it will be evident that strabismus, although influenced to a great extent by the state of the refraction can still exist when this is negligible. Sometimes when the refraction is comparatively high we find myopia associated with convergent squint or hypermetropia with divergence, when the reverse would seem more to be expected and actually in general is found in practice. We must realize, whatever the rule, Donders' observations do not apply in all cases.

Similarly, the postulation of Worth on the fusion sense does not explain all aspects. He suggested that simultaneous macular perception, that is images must be received by both maculæ and not vary between them as to their sharpness, was a necessary step in the treatment of strabismus.

Yet we find cases with congenital macula deficiencies reducing vision to less than 6/60 which respond to modern treatment, while it is a well known fact that a person blind in one eye seldom squints, and that when

this happens the blind eye tends to diverge. We know today that while amblyopia needs attention, yet it is often corrected by means of treatment to both eyes, whereas previously considerable attention was given to the bringing up the vision of the amblyopic eye, before orthoptic training of both eyes was commenced.

It is hoped to show that all methods are useful in their right places, and that by the use of the present methods, for the introduction of which opticians, alone, are responsible—no other profession can claim the credit —strabismus is curable, in much less time and in a greater percentage of cases than was formerly possible.

Whatever the causes of strabismus, and there are many, the important point is the age at which the squint first appeared. The age of onset is a powerful index as to the state of development that the binocular use of the eyes had reached, the advanced development being so much a process of education. Similarly, when amblyopia is present if we agree as seems evident that vision itself in its higher acuity stage is also a process of development, the age at which the squinting eye was noticed, may be assumed as the age at which the eye was ignored by the brain. The degree of acuity development previously reached by the eye, may be the utmost acuity possible later on when amblyopia training is proceeded with.

Often in practice it is found impossible to improve vision beyond 6/12 or 6/18, however much we try. We then assume in the absence of deformity, etc., that this was the stage of development reached when the squint appeared, and it is not possible to proceed further in improvement of visual acuity, although this will be no reason for not undertaking the training of the subject.

If we assume this development to take place with age, it will be found to be well supported in practice, a patient who squinted at 6 years of age responding to both amblyopic and orthoptic training much more easily than a patient who squinted at half this age. Here we restore the retarded development more quickly, because previous to the squint our patient had already possessed some binocular ability. A very young patient may not have reached a stage of development sufficient even to have possessed binocular vision. Our task in such circumstances is much more difficult and may even be impossible.

Thus it will be seen that all of the attributes binocularly of the normal eye may be considered as due to education, the infant being born with in general an undeveloped binocular sense. This is well seen in young children of 1 to 6 months. It is a matter of common observation, that they appear to fix first with one eye and then with the other. Harmonious movements are established later on.

When a squint appears, the binocular education is interrupted, and we speak of our efforts to correct the squint as re-education. A squinter has to be re-educated in the normal binocular processes, the development of which has been interfered with.

We start right from the beginning and correct in steps, aiming at restoring or developing the normal binocular functions, briefly outlined above.

In previous methods of squint treatment the classification of the type was all important particularly the differentiation between a unilateral or an alternating squint, and it was considered that an alternating squint was to be feared, records having shown that results were difficult to obtain in such cases. Today in many cases an alternating squint is considered the easier type with which to deal. As a rule vision is not affected or is equal in both eyes, and in consequence we have no amblyopia to deal with.

Squint may be convergent or divergent and of course unilateral or alternating. The cover test will determine this last point.

If the eye be covered and the other fixes a distant test type, obviously the eye will now squint which is covered. If we remove the cover, and the eyes stay as they were we can be sure, if the reverse eye squinted in the first place that an alternating squint is present. If the eyes move back to their original position after the cover is withdrawn, then a unilateral squint is present.

Probably the easiest clinical method of measuring squint is the Hirshberg methods, based on the adjustment of reflections from the cornea. This method though not strictly accurate is quite effective in practice.

One eye is made to fix and the light from an ophthalmoscope shone on to both eyes. The fixing eye will show a central reflection of the lamp,* the other showing a reflection which is misplaced. According to the position of the second image, and assuming the size of the pupil to be 3.5 mm. approximately (average) we are able to apply the following table.

On margin of pupil = 12-15°.
On iris halfway between center pupil and corneal margin 25°.
On or near corneal margin 45°.

An alternative method of measurement is that making use of the perimeter. An ordinary perimeter will do. With one eye fixing the mirror in the center of the arc, or a distant letter and ophthalmoscope is carried round the arc until the reflection of the lamp is centrally placed on the cornea of the squinting eye, the angle being found by reference to the scale on the back of the perimeter arc.

Other methods exist, such as the measurement with synoptophore or synoptiscope, the Priestly Smith tape, and the strabisometer. Information on these methods can either be obtained from the manufacturers or from most text books on the subject.

Having attempted to outline the basic binocular functions of normal

*The reflection may not coincide exactly with the center of the pupil due to angle alpha, but it will seldom be more than 3-5° out.

eyes manifested clinically; pointed out a few of the essential points with regard to squinting eyes; compared old points of view with the new ideas, and stressed that squint training is really a re-education of the functions, and in consequence nothing in general to do with muscles, we can now proceed with actual work in practice, explaining more fully the principles involved as we proceed.

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SOME MEANINGS AND DEFINITIONS IN RESEARCH FOR OPTOMETRISTS*

Dr. Carel C. Koch, editor of the American Journal of Optometry, says, "If optometry is to continue to be considered a profession, and recognized as such by the public, it is very important that we purge ourselves of all questionable commercial practices and all questionable teachers and teachings." And, in another editorial,[1] while referring to statements made concerning the practice of optometry, he advocates "that these and similar statements should be a call to optometry to put its house in order, to foster and support adequate courses of instruction in colleges and universities of high standing, and to practice the art and science of optometry and things germane thereto in an ethical and professional manner."

Much has been said concerning the house of optometry and its lack of order. Not too much has been done to advance the field to a more respected position among the arts and sciences. Of course, the usual

*Submitted August 4, 1938, for use as an editorial in American Journal of Optometry.

[1]American Journal of Optometry, November, 1936, Vol. 13, No. 11, p. 437.

few have done excellent research work, and have written excellent editorial comments. Some of these are members of the optometric practice; others are not. Although not all can be expected to do research work, it is discouraging to note how few of practicing optometrists can read intelligently what has been done in the field of optometric research.

The argument can be raised that research does not rear its head in practice for some ten or fifteen years after it has been done. But the students of today will, in fifteen years, still be unable to read, understand and criticize research studies intelligently. They will be unable to improve their techniques beyond what they were taught in optometry school. That is, unless there is adequate instruction in colleges and universities to prepare them for this need.

It is my contention that the field of optometry will become a respected profession when its members become professional, that is, when they practice according to scientific investigation rather than by personal experience; and that a knowledge of research methods is basic to this professional attitude. To this end, the following brief analysis of some of the meanings, definitions and factors present in research work is offered. Its value depends upon:

(1) Its careful consideration by those members of the teaching staffs of the optometric schools who alone are in a position to make it a part of the course of instruction;

(2) Its recognition by the members of the optometric practice as the means by which they can develop a more professional attitude. These considerations must be a necessary step in the advance of optometry as a profession.

Controlled Experience vs. Personal Experience

Optometry, like medicine, dentistry, and their related scientific fields, is in practice a combination of (1) reasoning based upon scientific investigation, and (2) the art of putting these factors and experiences together to produce a desired effect. However, at the present time, few optometrists reason other than by personal experience. In one respect, their inability to do otherwise is due to their ignorance of method of scientific investigation.

It is a stated fact that no single source of evidence is more universally employed in the search for truth than is personal experience. This method of reasoning may be a valuable source of evidence but it is subject to gross inaccuracies and error. A few of the more common sources of error in reasoning by this method are the following:

1. Argument from a single or limited number of instances;
2. Argument from positive instances, and neglect of negative instances;
3. Hasty generalization from insufficient evidence;
4. Inaccurate instruments of measurement; dependence upon subjective judgment, estimates and guesses;

5. Erroneous conclusions due to preconceived ideas and prejudices. The optometrist must, therefore, learn to distinguish between personal experience and scientific experience in his approach to a problem. The former usually contains many sources of error. On the other hand, experience that is carefully controlled and accurately and critically described, is the foundation of research.

Research

Research is the study of experience with the intention of being able to generalize on that experience. It includes making a hypothesis and testing it out. The quantitative or relative measurement in the process of testing out the hypothesis is the central part of research. An hypothesis is generally an uncontrolled observation which establishes a relationship between different phenomena or between factors in the same phenomenon. It is a guess, supposition or inference as to the existence of some fact or relationship. It serves the triple function of limiting the field of investigation, making the observer more sensitive to facts, and collecting in simple form the facts of observation. Invention is not always research, but it is often a very important part of the whole process of research. It involves making more sensitive measuring instruments, and arranging method and apparatus to produce more controlled observation, or to take into account added factors in the study of a specific problem.

How Do Research Problems Arise?

A problem for research may grow out of one's experience. It may arise as a felt need. It may be a problem upon the solution of which the professional standing of the optometrist rests. It may be a puzzling challenge because of its nature as an obstacle in the practical diagnosis and prescription for refractive error.

A second method of finding a problem is to read with a challenge. Be ready to question any statement of the writer which he does not show to be based upon controlled observation. Be critical where he mentions relationships based upon uncontrolled experience of a worker. Be alert where he raises a doubt as to the certainty of our knowledge concerning a fact. With this attitude one can easily detect many problems which often stand in the way of better technique in optometric practice.

A research problem is often suggested in a classroom or at a lecture. Where the speaker raises a doubt, leaves a gap, mentions an issue, or says, "We do not know," there may be found a possible field for research or a limited problem.

The most important method of locating a research problem is to train yourself to be able to recognize the frontier of a field. This presupposes a complete knowledge of the known field, and an ability to follow and understand the latest developments taking place in the field. When you have learned the basic facts, controlled and uncontrolled experiences, and the studies made under research conditions, then you are ready to use these as the basis for new and original work. Research is more than a summary of known facts or a different method of organiza-

tion of material: it is fundamentally a movement forward at some part of the frontier of the field in which you are interested. Good problems arise in some definite area of knowledge. As they are worked upon, they give rise to other problems so that the area becomes wider and wider; the solution of one problem is the beginning of another, and the frontier moves forward to open up a wider area of ignorance.

The following excerpt from the American Journal of Optometry[2] illustrates among other things how previous research studies and articles point out some problems for future study:

"Much has been written upon the subject of accommodation but upon close analysis one finds that many important points still remain unanswered. For instance, we still do not know about the relationship of the contraction of the ciliary muscle to the increase of the refraction of the lens. This question presents itself and still remains unanswered: 'Does it require maximum contraction of the ciliary to produce maximum amount of accommodation?'

"Hess suggested that for every diopter increase in refraction there is required an increase in ciliary contraction of the same amount. As a unit of measuring this contraction of the ciliary which is necessary to raise the accommodation from 0 to 1 diopter, Professors J. Von der Hoeve and H. J. Flieringo suggest the name myodiopter as the unit of measurement. To prove this hypothesis, Hess, Von der Hoeve and Flieringo conducted experiments in order to enable them to answer some of these questions:

(1) Is maximum ciliary contraction necessary to produce maximum of accommodation?

(2) Is the myodiopter a constant value?

(3) How strong is the power expressed in myodiopters?

(4) Is it possible to detect any slight paresis of the ciliary muscle?

"We are still in need of a technique which will enable us to measure accommodation more accurately clinically. That our present clinical methods for measuring accommodation are not very accurate was revealed by the writer recently[3] while carrying out a research problem on the reliability and variability of near point ocular tests. We found considerable differences in the accommodative power of the same person at the same time when two different kinds of accommodation tests were used.

"When we give the problem serious consideration we must conclude that our accommodative problems are still not solved. Further research is needed to determine the exact accommodative near point, the accommodative time for the normal performance of this function, and the retention time, that is, how long one can retain the same amount of

[2]J. I. Kurtz, "The Mechanism of Accommodation," *American Journal of Optometry*, July, 1935, Vol. 12, No. 7, pp. 285-287.

[3]J. I. Kurtz, "Reliability and Variability of Near Point Accommodation Tests," *American Journal of Optometry*, October, 1936, Vol. 13, No. 10, pp. 361-389.

accommodative power found at the beginning of the test. The subjective method of bringing the reading card closer to the patient's eyes is not a valid measure of this function. We should try to develop clinical objective methods which will enable us to measure the power of accommodation with a greater degree of accuracy than is possible with our present day techniques."

Analysis of Research Problem

The analysis of a research problem consists of a clear, concise statement of the problem, and the plans for solving, including fundamental assumptions, frame of reference, definitions, measurement, sampling and experimental control of group, methods of securing data and methods of tabulation of data. The problem is best stated in the form of a question or comparison. Upon the assumptions depend the validity of the measuring instruments and of the study as a whole. The definitions are important because the fallacy of hypothetization is so widely employed. This is the fallacy of naming a thing and accepting the name without validating it. Some methods of defining are the following:

(1) Dictionary or verbal definition.
(2) Description.
(3) Giving example.
(4) Giving a formula or recipe.
(5) Giving the unit of measurement used (one of best methods).
(6) Method of determination (e.g., Corneal curvature is that which is measured by the ophthalmometer).
(7) Arbitrary definitions.

Measurement is the attempt to make more precise our description of phenomena; to describe them quantitatively so that we may be able to compare. Upon the representativeness and adequacy of sampling depend our ability to generalize; to apply the results to a wider field. These are some of the conditions which a valid research study must satisfy.

Statistics

One cannot emphasize too much the growing importance of exact information as a basis for generalization and for rational explanation of phenomena. The more complex society grows, the greater is the part played by statistics in reducing our knowledge to precise and objective form. The necessity for a knowledge of statistics as a tool of every intelligent, well-informed person is gradually becoming more apparent.

One of the distinguishing characteristics of most fields of learning within the past twenty years has been the application of statistical procedures to the study of problems. Formerly, problems were dealt with in the light of personal experience, common sense judgments, and by logical thinking. Today we attempt to study principles by an analysis of many concrete situations, and to test these principles by a statistical treatment of the data. By accurately organizing the data, errors of judgment are eliminated, relationships are revealed, meanings and trends are indicated, and conclusions are deduced. In addition, the validity, reliability and probability of error of the data can be established.

There is need to know new terms, new types of graphical notation and mathematical formulae in order to read the literature intelligently. No person is equipped to meet problems successfully, or to understand them, unless he is master of the methods of statistics, knows its defects and limitations, can see where accurate figures are possible, can criticize statistical evidence, and knows what reliance he may place on the estimates obtained

Library

One method of keeping in touch with work in the field is by use of the library. The optometrist should know where he can find a treatment of the heads under which to draw up an outline of a proposed problem, how to draw up a schedule of kinds of library materials so as not to miss any important sources, best indexes for periodical literature on a problem, how to locate the statistics needed to work out or interpret a problem, in what form to record library findings, and other things of similar nature.

Other phases of research knowledge include the sampling and experimental control of group data, methods of validating tests, methods of tabulating data, criteria for determining how good a problem for research is, different methods of research, criteria for interpretation of present studies, etc. These and similar factors constitute the knowledge upon which depends the degree of scientific method which one is able to bring to the study of a specific problem.

Until now the results of optometric and psychological research for practicing optometrists have been meager. One obstacle to practical adoption of studies in optometry is the necessity for practicing optometrists to have a knowledge of research methods so that they can intelligently apply the instruments and interpret the results according to the meanings of the original research. When scientists in medicine find a reasonably sure test, as, for instance, for the prevention of diphtheria, every practitioner who hopes to maintain his professional status incorporates it into his body of knowledge. This need is rapidly becoming more apparent in optometry. However, our scientific journals describe methods and terms that are far beyond the comprehension of a large majority of optometrists.

Thus for further professional advancement the optometrist needs to know the facts and methods of research, statistics, library search, and other phases which will equip him for the scientific approach to, and working out of, challenging problems which arise in clinical practice. He would then have the facilities and background necessary for the interpretation of the present status of his professional field. In no other professional field is the need more apparent at the present time.

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BRITISH OPTOMETRISTS ANNOUNCE RESEARCH PROGRAM

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Under the leadership and guidance of the Institute of Ophthalmic Opticians, one of the foremost optometric bodies of Great Britain, a comprehensive research program has been inaugurated. The Institute, through one of its Standing Committees has adopted a program which calls for the immediate establishment of a bureau to compile and maintain a bibliographical and abstracting service of all optometric and ophthalmological literature. In addition to this bureau, the Committee intends to also establish a physiological testing laboratory, controlled by an independent technical committee. The purpose of this laboratory being to examine and report upon new instruments, apparatus and material as these are presented to the optometrists of England.

In the field of ocular research, the committee has made a number of suggestions dealing with refractive problems yet to be solved. These suggestions they have placed in their proper categories in the following outline. It must be understood, of course, that these categories should not be regarded as final, but rather as a logical and convenient sorting of the more important problems. In the left column the problems are stated and in the right are suggestions which the committee offer as to the manner in which the research problem might be approached.

Section A. VISUAL AND PHYSIOLOGICAL OPTICS

Detail.	*Treatment.*
(a) REFRACTION.	
(1) What are the respective limitations and merits of objective and subjective examination?	(1) The mathematical and theoretical case should be checked with practice and a considered statement issued.
(2) Chromatic tests.	(2) As for (1).
(3) Reading tests.	(3) Standards first need defining.
(4) Influence of pupil size in testing.	
(5) The trial case.	
(6) Minimum routine test required.	
(b) ACUITY.	
(1) To determine standard test for acuity.	(1) Investigation into and comparison of Broken C test and method of using difference in shape between a square and circle of equal area.

Treatment	*Detail*
(2) Should letters on test charts be serifed or non-serifed?	(2) Experimental work, using illiterate E, to determine which form is less susceptible to illumination changes.
(3) What is the most suitable degree of illumination of a test chart and which type of lamp is best; and whether standard of brightness evolved is applicable to projection apparatus and internal illumination charts.	(3) Experimental work after summary of existing data has been analyzed.
(4) Investigate claims made for *(a)* Contact lenses. *(b)* Pinhole and multiple apperture spectacles. *(c)* Slit spectacles. *(d)* Cataract readers. *(e)* Telescopic spectacles. and any other existing optical methods of improving vision of eyes, which, although not suffering from active disease, cannot obtain normal acuity or comfortable vision by ordinary methods of correction.	(4) Laboratory and clinical investigation into the principles of these methods and devices in order to determine techniques of application.
(c) MYOPIA.	
(1) Statement of types required.	
(2) Determination of the optical factors in treatment of myopia.	
(3) What weight can be given to methods of nature-cure practitioners, and can they be profitably used by opticians?	

Detail.	*Treatment.*
(d) ASTIGMATISM.	
(1) The relation between corneal and subjective astigmatism.	(1) Critical analysis of literature in first instance.
(2) Does astigmatic accommodation exist?	
(e) LIGHT SENSE.	
(1) Apparatus to measure needs designing.	
(f) PERIPHERAL VISION.	
(1) General investigation desired.	
Section B.	
BINOCULAR VISION	
(a) GENERAL.	
(1) Binocular testing.	(1) Considered statement required, in first instance, on theory of monocular tests in presence of binocular vision.
(2) What is normal and abnormal "suppression" and "suspension."	(2) Definition of terms, and investigation of process between retina and brain.
(b) THE DOMINANT EYE.	(1) Laboratory, clinical and statistical investigation.
(1) A clinical test is required to determine.	(2) As (1).
(2) Validity of the claims for *(a)* placing dissociating devices over dominant eye in muscle testing;	
(b) placing all prismatic correction over non-dominant eye;	

Detail.	*Treatment.*
(c) never allowing the dominant eye to have a lower V.A. than the other eye; need testing.	
(c) HETEROPHORIA.	
(1) Primary definitions are required before the real problems can be correctly stated.	
(d) SQUINT.	
(1) Its causes.	(1) Is there a correlation between certain physiological or temperamental factors and squint?
(2) Merits of various forms of treatment.	(2) Statistical survey involving correlation between method and result.
(3) Does stereopsis exist in cases of squint?	(3) Clinical investigation.
(e) STEREOSCOPIC VISION.	
(1) Standards required.	
(f) ACCOMMODATION-CONVERGENCE.	
(1) Further investigation of accommodation - convergence relationship desired.	
(2) Comparative accommodative activity as between an amblyopic and its fellow eye.	(2) Dynamic retinoscopy.
Section C.	
LENSES	
(1) Creation of standards of accuracy, power, centration and thickness.	(1) Revision of Optical Society's standards in the light of modern knowledge and present conditions.

Detail.	*Treatment.*
(2) No organization exists for agreeing performance or properties claimed for lenses.	(2) Creation of Standards Bureaux as part of Research Organization.
(3) Is it possible to create standards covering *(a)* glass quality? *(b)* surface quality and figure?	(3) *(b)* Investigation into mechanical accuracy obtainable and the mathematical theory of the image.
(4) Is it possible to create standards covering prescription quality, including limits of error in power?	
(5) Respctive performance of different lens forms.	(5) Physical investigation into aberrations. Statement of physiological factors before manufacturing beyond agreed limits. Experimental and laboratory investigation.
(6) Bifocals need comparing and standards issued.	(6) Physical investigation into image formed by each type.
(7) Bifocal centration—what are physiological effects of those which cannot be correctly centered?	(7) Physical investigation into displacement of the images formed.
(8) Respective performances of absorption lenses.	
(9) Design of simple instrument or tables to assist refractionists to determine the back vertex power of a series of lenses in the trial frame.	
(10) What are the merits of synthetic spectacle lenses?	
Section D. FRAMES.	
(1) No considered statement	(1) Physical tests required of vari-

Detail	*Treatment.*
exists as to the merits or demerits of the various materials used.	ous types of gold-filled and imitation shell materials should be analyzed to determine their suitability and wearing qualities.
(2) Opticians lack proper measurement standards.	(2) Revision of Optical Society's standards in light of present knowledge and conditions and creation of standards which should be used by the manufacturer and the frame-fitter.
(3) Pad-bridge frames.	(3) Should be investigated in conjunction with the anatomy of the nose.
(4) Face measurements—standards are required.	(4) Statistical analysis.
Section E. OPHTHALMIC INSTRUMENTS	
(1) Comparative analysis required of various objective optometers — Fincham, Zeiss, Busch and the Keeler-Decagon and Collins electronic refractionometers.	(1) Laboratory and clinical investigation to compare findings with retinoscopy and subjective findings.
(2) General—the Consulting Room.	(2) Standard of the ideal and the minimum.
Section F. DRUGS	
(1) What percentage of patients cannot be tested without drugs and what are those cases?	(1) Clinical investigation and statistical analysis.
(2) What are the allowances which have to be made after eyes have been tested under drugs?	

Detail	*Treatment*
Section G.	
TUITION AND EXAMINATION.	
(1) Cohesion of teaching methods and curricula in colleges and institutes.	(1) Investigation by committee of teachers and technical experts under auspices of the Institute and establishment of minimum standards.
(2) Co-operation of teaching, examining and research organizations.	(2) Honors examinations to be linked with research problems.
(3) Adherence to common sign and symbol convention by schools and journals and opticians.	(3) Committee to frame, and after being issued for comment and /or criticism, to be published as official for use in all approved technical schools and technical journals.
Section H.	
EYES AND OCCUPATIONS.	
(1) Standards of visual ability necessary to particular occupations.	(1) Co-operation with other industries and probably N.I.I.P. and illuminating engineers.
(2) Protective lenses for industrial occupations.	(2) Co-operation with British Standards Institution (Institute is already doing this) and Home Office.
(3) Ocular factors in road safety.	(3) Co-operation with Ministry of Transport.

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BOOK NOTICES

THE FUNDAMENTALS OF CHROME-ORTHOPTICS. William Henning, Opt.D., F.A.A.O. Published by the Actino Laboratories, Inc., 429 West Superior Street, Chicago, Ill. Second Edition. 84 pages. Illustrated. Board Covers. $1.65. 1938.

The first section of this work deals with an exposition of the theories behind the treatment techniques suggested by Henning and Loeb. The author here advises the therapeutic use of certain portions of the

visible spectrum under certain controlled conditions in certain cases of eye involvement.

The second portion of the work consists of a number of detailed case reports presented by Henning compiled from the records of various practitioners in which these suggested treatment techniques were employed. This edition differs from the first chiefly in the arrangement of sequence of the material dealing with refraction and ocular examinations inasmuch as the author no longer follows the examination routine suggested by the Skeffington-Graduate Extension Program.

It is suggested in future editions of this work that the occasional reference to Bulletin material be deleted, and that the material referred to be inserted for the benefit of readers who have no file of the bulletins at hand. The monograph presents Henning's views of this type of treatment technique and becomes an interesting part of that section of optometric literature dealing with orthoptics. C. C. K.

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ABSTRACTS

DYSLEXIA OR READING DISABILITY. S. Stinchfield-Hawk. Visual Digest. Vol. 2, No. 2, pp. 8-12. 1938.

This paper deals with reading disability due to defective vision. The author who is connected with the Child Guidance Clinic of Los Angeles claims that there are many children in the first three grades of school who are unfitted for the reading processes required of these students. For these cases orthoptic training is suggested. T. O. B.

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PHYSIOLOGICAL REHABILITATION. G. C. Wise. The Mid-West Optometric Journal. Vol. 5, No. 11, p. 7, 1938.

Wise suggests the use of the following five steps in the therapeutic process of ocular physiological rehabilitation. These steps should proceed regular orthoptic techniques. The suggested steps are (1) Monocular rotational exercises, (2) Peripheral stimulation, (3) Monocular macular fixation demand, (4) Binocular macular fixation demand, and (5) Monocular ciliary stimulation. Wise gives a brief description of each technique with this paper. T. O. B.

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CARE OF THE DENTIST'S EYES. R. L. Bower. Journal of the American Dental Association. August, 1938.

For the dentist past 40 or 45 years of age, with his permanent loss

of serviceable accommodation, Bower suggests the use of a bifocal correction, for use at the chair only, with the large field of the glass for near-point work and the small upper field for distance vision. This type of reverse bifocal should be part of every dentist's equipment, claims Bower.

T. O. B.

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STRABISMUS. Charles Sheard. Eye, Ear, Nose and Throat Monthly. May, 1937.

Sheard in a paper which deals with the treatment of strabismus reviews the four main purposes for which prisms may be prescribed. These are (1) to compensate permanently for innervational excesses or insufficiencies, or anatomic defects, (2) to stimulate proper functioning of impaired fusional mechanism, (3) to afford temporarily such optical assistance that the innervation which is delivered to the extra-ocular muscles is balanced in equilibrium and perfectly reciprocal, and the eyes move freely to the position of equilibrium under dissociation, or to the position of parallelism or of the requisite convergence under fusional stress, (4) to relieve temporarily innervational and muscular tension by inducing relaxation and to aid in establishing normal fusional habits.

T. O. B.

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The American Journal of Optometry is a monthly journal, published in annual volumes of about five hundred pages of reading matter each, illustrated where necessary, by cuts in the text.

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